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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,250	01/15/2004	Douglas Melton Carper	121497 (07783-0172)	6395

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EXAMINER	
MAYES, MELVIN C	

ART UNIT	PAPER NUMBER
1791	

MAIL DATE	DELIVERY MODE
01/09/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/758,250	CARPER ET AL.
	Examiner	Art Unit
	Melvin Curtis Mayes	1791

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 24 October 2007.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) 1-11 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 12-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

(1)

This application contains claims 1-11 drawn to an invention nonelected with traverse in the reply filed on April 19, 2006. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

(2)

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(3)

Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as obvious over Steibel et al. 6,280,550 in view of JP 6-137103 and Baldwin et al. 5,279,892.

Steibel et al. 6,280,550 discloses a method of making a composite turbine blade comprising: providing first reinforcement comprising an insert preform of silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity); optionally depositing matrix material to fill only a portion of the porosity of the insert preform (silicon-silicon carbide composite preform having some porosity); providing second reinforcement comprising silicon carbide fabric plies (outer shell section preform); applying the silicon carbide fabric plies to contact the insert and define the surface shape of the blade; and

depositing matrix material into the porosity of the first and second reinforcement, the depositing also providing bonding between the first and second reinforcements. Matrix material may be deposited by melt infiltration of silicon so that the matrix is silicon carbide or mixture of silicon and silicon carbide (col. 2-7). Steibel et al. do not disclose providing the composite turbine blade with a dovetail section by inserting an insert preform in the dovetail section.

JP 6-137103 teaches that a fiber reinforced composite turbine blade, such as of fiber strengthening ceramic (ceramic matrix composite), is made with a dovetail section using reinforcing fiber which extends from the dovetail section to the blade part (Abstract and computer translation).

Baldwin teaches that in making composite airfoils (fan blades), inserts or "preforms" are provided in both the blade part to form the core of the blade and in the root part (dovetail) of the blade. The inserts are made to be of the same composite material as the composite material layered over the inserts to form the composite blade. Using inserts enhance producibility and eliminate hundreds of prepreg layers, especially in the thick root sections (col. 2, lines 13-57, col. 4, lines 44-46).

It would have been obvious to one of ordinary skill in the art to have modified the method of Steibel et al. for making a composite turbine blade by making the turbine blade with a dovetail section, as taught by JP '103, as provided as part of a turbine blade and also made during the fabrication of a fiber reinforced composite blade. Providing the fabric plies (outer shell section preform) to extend from the blade part to a dovetail section to form both the blade and dovetail section of a turbine blade in one step of matrix deposition would have been obvious

to one of ordinary skill in the art, as JP '103 teaches that the reinforcing fiber for a turbine blade extends from the blade section to the dovetail section.

Providing an insert preform not only in the blade section but also in the dovetail section would have been obvious to one of ordinary skill in the art, as Baldwin teaches that a composite fan blade having a root part (dovetail) is provided with insert (insert preform) not only in the blade part but also in the dovetail part in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Providing an insert (insert preform) in the dovetail section as silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity), or silicon-silicon carbide composite preform having some porosity, would have been obvious to one of ordinary skill in the art to provide an insert preform in the dovetail section similar to that provided in the blade section to allow for deposition of matrix by silicon melt infiltration and bonding between the preform and the fabric plies, as disclosed by Steibel et al. It would have been obvious to one of ordinary skill in the art that, in making a silicon carbide-silicon carbide composite turbine blade using insert preforms in both the blade part and dovetail part, to provide the insert preforms as similar in composition to each other and to the fabric plies which are to contact the insert preforms, as Baldwin et al. teach that the insert in the blade part and dovetail part are similar in composition and to that of the prepreg layers (plies) to enhance producibility and to reduce the number of prepreg layers required, especially in the thick dovetail part of the blade. The use of the same type of insert preform in the dovetail section as used in the blade section would have been obvious to one of ordinary skill in the art, as clearly suggested by Baldwin, to make a composite blade.

Further, by providing a second reinforcement of silicon carbide fabric plies for defining the surface shape of the blade and into which silicon can be deposited by melt infiltration, an outer shell preform having at least some porosity is obviously provided.

(4)

Claims 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Steibel et al. 6,280,550 in view of JP 6-137103, Baldwin et al. 5,049,036 and Steibel et al. 6,258,737.

Steibel et al. 6,280,550 discloses a method of making a composite turbine blade comprising: providing first reinforcement comprising an insert preform of silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity); optionally depositing matrix material to fill only a portion of the porosity of the insert preform (silicon-silicon carbide composite preform having some porosity); providing second reinforcement comprising silicon carbide fabric plies (preform); applying the silicon carbide fabric plies to contact the insert preform and define the surface shape of the blade; and depositing matrix material into the porosity of the first and second reinforcement, the depositing also providing bonding between the first and second reinforcements. Matrix material may be deposited by melt infiltration of silicon so that the matrix is silicon carbide or mixture of silicon and silicon carbide. As shown in Figure 7, the insert is provided in the dovetail section of the blade (col. 2-7). Steibel et al. do not specifically disclose providing the second reinforcement as plies of silicon carbide prepreg cloth or disclose providing the composite turbine blade with a dovetail section by inserting an insert preform in the dovetail section.

JP 6-137103 teaches that a fiber reinforced composite turbine blade, such as of fiber strengthening ceramic (ceramic matrix composite), is made with a dovetail section using

reinforcing fiber which extended from the dovetail section to the blade part (Abstract and computer translation).

Baldwin teaches that in making composite airfoils (fan blades), inserts or "preforms" are provided in both the blade part to form the core of the blade and in the root part (dovetail) of the blade. The preform inserts are made to be of the same composite material as the composite material layered over the inserts to form the composite blade. Using insert enhances producibility and eliminates the hundreds of prepreg layers, especially in the thick root sections (col. 2, lines 13-57, col. 4, lines 44-46).

Steibel et al. '737 teaches that in making a silicon carbide composite by melt infiltration with silicon, the silicon carbide fiber fabric is impregnated with high char yield slurry to form a prepreg before melt infiltration. The use of a high char yielding resin improves increases burn-out strength, produces a hard, tough preform and provides integrity to the preform structure during silicon melt infiltration. Steibel et al. further teach that before melt infiltration, the impregnated fabric (prepregged cloth) is either subjected to compression molding, bladder molding or autoclaving to form a preform for melt infiltration. Steibel et al. also teach that carbon of micrometer particle size provided in silicon carbide preforms to give different composite properties of structure (col. 5, line 50 - col. 6, line 11, col. 6, line 64 - col. 7, line 12).

It would have been obvious to one of ordinary skill in the art to have modified the method of Steibel et al. for making a composite turbine blade by making the turbine blade with a dovetail section, as taught by JP '103 as provided as part of a turbine blade and also made during the fabrication of a fiber reinforced composite blade. Providing the fabric plies (outer shell section preform) to extend from the blade part to a dovetail section to form both the blade and

dovetail section of a turbine blade in one step of matrix deposition would have been obvious to one of ordinary skill in the art, as JP '103 teaches that the reinforcing fiber for a turbine blade extends from the blade to the dovetail section.

Providing an insert preform not only in the blade section but also in the dovetail section would have been obvious to one of ordinary skill in the art, as Baldwin teaches that a composite fan blade having a root part (dovetail) is provided with insert (insert preform) not only in the blade part but also in the dovetail part in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Providing an insert (insert preform) in the dovetail section as silicon carbidé fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity), or silicon-silicon carbide composite preform having some porosity, would have been obvious to one of ordinary skill in the art to provide an insert preform in the dovetail section similar to that provided in the blade section to allow for deposition of matrix by silicon melt infiltration and bonding between the preform and the fabric plies, as disclosed by Steibel et al. It would have been obvious to one of ordinary skill in the art that, in making a silicon carbide-silicon carbide composite turbine blade using insert preforms in both the blade part and dovetail part, to provide the insert preforms as similar in composition to each other and to the fabric plies which are to contact the insert preforms, as Baldwin et al. teach that the insert in the blade part and dovetail part are similar in composition and to that of the prepreg layers (plies) to enhance producibility and to reduce the number of prepreg layers required, especially in the thick dovetail part of the blade. The use of the same type of insert preform in the dovetail section as used in the blade section would have been obvious to one of ordinary skill in the art, as clearly suggested by Baldwin, to make a composite blade.

It would have been obvious to one of ordinary skill in the art to have further modified the method of Steibel et al. for making a composite turbine blade by providing the second reinforcement as impregnated with high char yielding slurry (prepregged or a preform) before contacting the insert preform, as taught by Steibel et al. '737, as impregnated in silicon carbon fiber fabric before silicon melt infiltration to increase burn-out strength, produce a hard, tough preform and provide integrity during silicon melt infiltration.

Autoclaving the assembly of second reinforcement prepreg and insert preform before silicon melt infiltration, as claimed in Claim 12, would have been obvious to one of ordinary skill in the art, as taught by Steibel et al. '737, to aid in forming the prepreg into preform shape before melt infiltration. It would have been obvious to have autoclaved to help shape the prepregged plies into the surface shape of the blade.

Providing the silicon-silicon carbide insert preform with carbon microspheres, as claimed in Claims 14 and 19, would have been obvious to one of ordinary skill in the art, as taught by Steibel et al. '737, as added to silicon carbide preforms to give different composite properties of structure. The use of carbon microspheres in either of the insert preform or second reinforcement preform would have been obvious to one ordinary skill in the art depending on desired composites properties of the insert or the surface of the composite turbine blade.

Response to Arguments

(5)

Applicant's arguments filed October 24, 2007 have been fully considered but they are not persuasive.

Applicant argues that the field of resin/cloth composites is not "similar" to ceramic matrix composites, argues that Baldwin et al. does disclose composite preforms in dovetails of composite blades but is limited to cloth/resin composites in which there is no infiltration step. Applicant argues that the Examiner has used hindsight reconstruction and cites motivation that fails in light of the differences in material and manufacturing limitations. Applicant argues that the combination of references fails to disclose inserts as limited by the claim language nor the bond formation of the core inserts as claimed. Applicant argues that Steibel et al. '550 is directed to the vane section of a turbine blade and is silent as to the dovetail section and argues that one of ordinary skill in the art would not find obvious the interchangeability of components including inserts between the vane portion and dovetail portion. Applicant argues that Baldwin et al. is non-analogous art directed to cloth/resin composite blades as compared to ceramic matrix composite made by silicon melt infiltration of Steibel et al.

(6)

Applicant's arguments have been considered but are not convincing. The basic process of making a ceramic matrix composite turbine blade using a composite preform insert (the claimed "silicon carbide-silicon carbide composite preform having at least some porosity"), silicon carbide plies as outer shell preform, assembling and silicon melt infiltration to fill porosity and provide bonding is clearly disclosed by Steibel et al. '550. While Steibel et al. '550 may not

disclose that the composite turbine blade has a dovetail section, such is known in the art of making composite turbine blades, such as suggested by JP 6-137103. JP '103 teaches that a fiber reinforced composite turbine blade is made with a dovetail section using reinforcing fiber which extends from the dovetail section to the blade part. The reference is also particularly relevant because it teaches that turbine blades made by such process can be of various fiber strengthening composites such as fiber reinforced plastics (i.e., resin matrix composites), fiber reinforced metal (i.e., metal matrix composites), fiber strengthening ceramic (i.e., ceramic matrix composites) and fiber strengthening carbon (i.e., carbon matrix composites) [0009]. Thus making a turbine blade with a dovetail section is known in the art for all types of composite turbine blades.

At issue is whether it would have been obvious to then provide a composite preform insert such as disclosed by Steibel '550 not only in the vane section but also in this dovetail section when making a ceramic matrix composite turbine blade. Baldwin is pertinent because the reference suggests that it would been obvious to one of ordinary skill in the art to have provided an insert preform not only in the blade section but also in the dovetail section in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Inserts suggested by Baldwin are made to be of the same composite material as the composite material layered over the inserts to form the composite blade, which would have suggested to one of ordinary skill in the art to have used a composite insert preform as disclosed by Steibel et al. also in the dovetail section.

Applicant argues that Baldwin is not analogous art because the reference is directed to cloth/resin composite blades as compared to ceramic matrix composite made by silicon melt infiltration of Steibel et al. However, it has been held that a prior art reference must either be in

the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Baldwin is not only in the field of applicant's endeavor, that being the field of making composite turbine blades, but also reasonably pertinent to the particular problem with which the applicant was concerned, that being how to provide an insert in the dovetail section of the composite turbine blade. Applicant appears to contend that the resin matrix composites and ceramic matrix composites made by melt infiltration are so different in processing and are such different fields that teachings such as from the Baldwin reference, which is particularly directed to resin matrix composites are not relevant to composite processing such as of Steibel, which is particularly directed to ceramic matrix composites, However, not only are both references related to forming composite turbine blades but also forming composite blades having inserts. The particular composite fields of resin matrix composites and ceramic matrix composites are not as disparate as Applicant contends, and one of ordinary skill in the art of composites is familiar with both resin matrix composite processing and ceramic matrix composite processing.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case, providing an insert preform not only in the blade

section but also in the dovetail section in order to enhance producibility and reduce the number of prepreg layers, such insert of the same composite material as the composite material layered over the inserts to form the composite blade, is knowledge which was within the level of ordinary skill at the time the claimed invention was made, as suggested by Baldwin. The Examiner does not understand how using a composite insert preform as disclosed by Steibel et al. also in the dovetails section, as suggested by Baldwin, "fails in light of the differences in material and manufacturing limitations" when there is no failure when such an insert is used in the vane section of the blade.

With respect to bond formation of the core inserts as claimed, Steibel et al. disclose that the silicon melt infiltration fills porosity and provides bonding. Thus this silicon melt infiltration would provide bonding between the outer shell preform and the inserts in the vane section and dovetail section.

Conclusion

(7)

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wilder, Jr. 3,132,841 teaches providing an insert in the foot portion (dovetail) of a composite blade, of which the insert can be of material similar to that which forms the plies.

(8)

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 571-272-1234. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Phillip C. Tucker can be reached on 571-272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Melvin Curtis Mayes
Primary Examiner
Art Unit 1791

MCM
January 7, 2008